DESIGN AND FABRICATION OF OPTICAL STRAIGHT CHANNEL WAVEGUIDE

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ABSTRACT

FABRICATION OF OPTICAL STRAIGHT CHANNEL WAVEGUIDE

This paper reports the fabrication of optical straight channel waveguide using coating process. The first part will be fabricating a planar waveguide by coating thin film of polymer SU-8. The refractive index for SU-8 is 1.58. From here, a channel waveguide (straight and taper) was successfully designed using FIMMPROP software. And the widths for straight channel investigated are between 1.4 μm and 10 μm. For the taper waveguide, the input width was design at 10.0 μm and output width 1.4 μm. An initial design with 65.7% efficiency was optimised using a commercial optimizer. The final optimum design gives a power transfer efficiency of 86%. But the pattern cannot be written on the sample because of technical problem in the operation of the equipment. At the end of this project, a planar polymer waveguide was fabricated and a single mode straight waveguide and an optimised taper with 86% power transfer efficiency were designed. This project should be continued for the next time. This process is easy and simply for any design of polymer waveguide.

CHAPTER 1

INTRODUCTION

1.1 General introduction

Optical polymers were engineered in many laboratories worldwide and some are available commercially. Polymer materials offer many advantage over traditional material such as lithium niobate, silicon, etc that used for optical waveguide fabrication. These materials have an obvious advantage in throughput, producing wafers between 10 and 1000 times faster than other planar technologies. Other advantages are their low cost of production and ease of processing and fabrication. Polymeric materials may be easily engineered to obtain the desired optical parameters such as the bandwidth of transparency, high electro-optic coefficient values, and temperature stability for specific photonic application.

Some common techniques used for polymeric waveguide fabrication include photolithography and reactive ion etching, photobleaching, and high-energy ion implantation. These methods involve numerous processing steps or make use of conventional mask; based techniques that require the design and fabrication of a mask before waveguides can be fabricated. Direct write techniques such as laser direct-writing, electron beam lithography, and proton beam writing, on the other hand, have the advantage of being maskless, allowing rapid and inexpensive prototyping.